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ABSTRACT

A systematic needs assessment model that may be useful to program planners in designing student personnel services is examined, and its implementation at East Central University in Ada, Oklahoma, during the 1979-80 academic year is described. The focus of the model is on identifying groups of students with similar service delivery needs through the use of a cluster analytic technique. In addition, service needs profiles are developed in relation to ratings of knowledge of service availability, projected use, and perceived need. The cluster analytic needs assessment model consists of four steps: identification of institutional goals; assessment of the current level of programming; assessment of the desired level of programming; and analysis of assessment data with accompanying suggestions for program changes or refinements. At East Central University, a questionnaire concerning student personnel services was administered to a random sample of students, and a three-stage strategy was used to analyze the resulting data. Fifty service items were factor analyzed to determine if students indicated a need for particular groups of services or would use those services, or had knowledge of those services. Factor scores generated from the service group factors were then analyzed using a hierarchical cluster analysis to group student respondents on the basis of their service profile. Cross-tabulations were employed to relate student background characteristics to service cluster membership to ascertain what patterns of background characteristics were connected to specific service clusters. This method facilitated assessment of each program or service within the context of the total student personnel program with respect to specific configurations of the total student body. A bibliography and lists of factor patterns are appended. (SW)

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A Cluster Analytic Needs Assessment Model for Student Personnel Program Planning in Higher Education

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Running Head: Needs Assessment Model

HE 014 131

THE ASSOCIATION FOR INSTITUTIONAL RESEARCH

This paper was presented at the Twenty-First Annual Forum of the Association for Institutional Research held at the Leamington Hotel in Minneapolis, Minnesota, May 17-20, 1981. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Mary Corcoran
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Abstract

The purpose of this paper is to describe a systematic needs assessment model that may be useful to program planners in designing student personnel services. The focus of this model is on identifying groups of students with similar service delivery needs through the use of a cluster analytic technique. In addition, service needs profiles are developed in relation to ratings of knowledge of service availability, projected use, and perceived need. This model is advocated as more useful than other needs assessment models in identifying specific groups of students who have distinctive patterns of service needs.

A Cluster Analytic Needs Assessment Model for Student Personnel Program Planning in Higher Education

Student assessments of student personnel programs are frequently used by administrators to justify the continuation, expansion, addition, or deletion of particular programs and services. These assessments are usually designed to provide information concerning student knowledge of services, satisfaction with services, and/or perception of need for existing or projected services. A review of literature in this area indicates that many of these assessments focus on the services of particular offices within divisions of students affairs, e.g., health services (King, 1973), mental health services (McWilliams and Gerber, 1978), and career planning (Ard and Hyder, 1978). Other studies focus on the programming needs of particular types of students, e.g., adults (Sturtz, 1971), or undergraduate adults (Rawlings, 1979), or part-time adults (Jones and Diener, 1975), women (Hipple and Hill, 1973), "returning women" (Brandenburg, 1973), men (Hochmar and Nietfeld, 1976), commuter students (Graff and Cosley, 1970; Hardwick and Kazlo, 1973), and married students (Flores, 1975; Greenberg and DeCoster, 1976). Still others examine the combination of particular types of students with particular types of program offerings, e.g., financial aid needs of part-time students (Schubert and Dietz, 1979), career planning needs of freshman students (Walters and Saddlemire, 1979) and white and non-white commuter student needs (Sedlacek, Brooks, Migares, and Hardwick, 1976). A few studies have examined need, usage, and/or knowledge of programs (e.g., Karmer, Berger, and Miller, 1974; Carney and Barak, 1976; and Hallenback, 1978) and at least one has sought to explore if students evaluate need for services differently depending upon their intended use of these services. For example, Friedlander (1978) noted that students may rate a service as very important,

even though they do not intend to use it. Thus, an accurate portrait of student projected use may not be obtained if only evaluations of students' perceived needs are used in making decisions about whether programs should be added, deleted, expanded, or contracted.

The major limitation of these studies is that they tend to focus on particular services offered by student affairs programs, and findings are usually presented in the form of bivariate frequency analyses, i.e., the need and/or use of a particular service or program by class standing, sex, race, place of residence, or in some cases, by some combination of one or two of these variables. What is needed is a model which will enable decision-makers to assess each program or service within the context of the total program of services sponsored by the institution with respect to specific configurations of the total student body. The purpose of this paper is, therefore, to illustrate a needs assessment model which provides a more systematic, exact, and comprehensive analysis of student service needs and intended use than models currently used. We call this model a cluster analytic needs assessment model. We will define this model below, and will illustrate its utility by describing its implementation at East Central University (ECU) in Ada, Oklahoma during the 1979-80 academic year.

The Model

The Cluster Analytic Needs Assessment Model consists of four steps: (1) identification of institutional goals; (2) assessment of the current level of programming; (3) assessment of the desired level of programming; and (4) analysis of assessment data with accompanying suggestions for program changes or refinements. Steps 1 and 2 serve to provide the information necessary for the construction of the comprehensive survey instrument used in step 3 to obtain assessment data from students. In step 1, this information may come from master plans, institutional self studies, or interviews with policy-makers as to the direction

which the institution is taking, and, which, therefore, provides "leads" for assessing the need and use for, and knowledge of, programs or services. In step 2, information on the current level of programming is obtained from two major sources, i.e., from institutional publications describing programs and services and from interviews with various student personnel administrators. The information obtained in steps 1 and 2 above serves to provide the content for a series of Likert-type items assessing students' perceptions of their need and use of each actual and projected service or program. In addition, items requesting demographic characteristics related to need and use are incorporated in the questionnaire, i.e., items related to age, sex, race, marital status, class load, class status, and place of residence. The resulting questionnaire may be sent to a systematic sample of all currently enrolled students using accepted methods of sampling and data collection procedures. The analysis of this data with attendant recommendations constitutes the heart of the cluster analytic model, and will be described below using data collected from ECU.

The ECU Study

ECU is located in Ada, Oklahoma, and is a regional 4-year institution with a total enrollment of between 3,500 and 4,000 students. Following the procedure described in steps 1 and 2, some 50 items representing current or projected programs from the various offices in the student affairs division (housing, counseling, career planning, financial aid, and health services) were incorporated in the questionnaire along with demographic items. This questionnaire was mailed to a 25% systematic random sample (n=901) from a list of all enrolled head count students. With one follow-up effort via telephone, a 62% return (n=560) was achieved. A comparison of student background characteristics of the population with respondents and non-respondents indicated that there

were no significant differences between respondents and non-respondents or between respondents and the population except that part-time students were underrepresented (by 15 percentage points). Consequently, analyses related to part-time students should be used only with caution.

Analysis Strategy

A three stage strategy was used to analyze the data generated from the student questionnaires for each set of service items respectively (i.e., need, use and knowledge). The first step for each item group consisted of a factor analysis of the fifty service items to determine if, in fact, students did indicate a need for particular groups of services or would use those services, or had knowledge of those services. In the second step, factor scores generated from the service group factors of step one were analyzed using a hierarchical cluster analysis to group student respondents on the basis of their service group profile. Finally, crosstabulations were employed to relate student background characteristics to service cluster membership to ascertain what patterns of background characteristics were connected to specific service clusters. Each of these steps shall be discussed in more detail.

The expressed service need, use and knowledge items were factor analyzed separately using a principal axis method. An orthogonal varimax rotation was used to obtain final factors. These factor analyses yielded ten rotated factors accounting for about fifty-five percent of the variance in each item set with readily interpretable loading patterns. Factor loadings for both item sets greater than .40 are presented in Table 1 and Table 2 along with proposed verbal labels for the factors. It is clear from these tables that students did group their service needs into quite reasonable patterns. Moreover, there are several factors, i.e., living conditions, career services and commuter services with almost identical item sets loaded on them

Tables 1 and 2 about here

Since a profile of ten factor scores would reflect the degree to which a student expressed anticipated need and usage for, or knowledge of, the various service groups, the factor scores for the two sets of ten factors arrived at in step one were utilized in a hierarchical cluster analysis to group students on the basis of their service group factor score profiles. In general, cluster analyses group units together on the basis of the "similarity" of the values on a number of variables. While the measure of similarity may have several forms, the Euclidean distance between score profiles is often used. (Bailey, 1977; Tryon and Bailey, 1970). The Euclidean distance between two units is calculated by subtracting the two score profile vectors, squaring the resulting differences and then taking the square root of the sum of these squared differences. Clearly, the smaller the Euclidean distance between two cases, the more "similar" they are with respect to their scores.

Hierarchical cluster analysis groups cases using the Euclidean distance scores in the following manner. First, the distances between all N pairs of cases are examined. The pair with the greatest similarity, i.e., smallest distance, is then amalgamated into a single case by calculating a centroid or mean score profile for the two. Then, distances are recalculated for all pairs of this set of N-1 cases and another pair is amalgamated in a like manner. While this process can be allowed to continue until all the cases are placed in one cluster, in fact, the process is stopped at a reasonable point by inspection of a dendrogram or linkage tree which reveals the order of case amalgamation and the levels of measures of similarity at which cases were combined. Figure 1 presents an example of a dendrogram. While there are no set rules for determining the final number of clusters, examination of the dendrogram and a

knowledge of the problem at hand allows reasonable groupings to be made (Bailey, 1977; Sills, 1968; Tryon and Bailey, 1970). Ten student service profile groupings were extracted from each separate cluster analysis of the need and projected use items. These will be discussed in more detail later.

Figure 1 about here

In order to ascertain the nature of the service mix for each student group, the mean factor score profiles for each group were calculated and examined. Figure 2 presents a graphic illustration of such a profile for Cluster 1 of

Figure 2 about here

the projected use items. Since the items were scored on a numeric scale that was inversely related to strength of projected use (i.e., 1 = use very often and 5 = would not use), a low factor score indicates a high level of projected use and vice versa. Thus, for the example presented in Figure 2, students in this cluster expressed a high projected use of career services and a very low projected use for services related to campus living conditions, financial matters, orientation and commuter services. Lesser deviations are observed for marital counseling services, self improvement services and handbook information. While not presented here for reasons of space, all the profiles for expressed need, projected use and knowledge were examined in a similar fashion to ascertain the most and least important service group profiles for each student cluster.

In addition to examining cluster factor score profiles, student cluster membership was crosstabulated with (1) student age (17-22 versus 23+ years), (2) race (white versus nonwhite), (3) enrollment hours (1-11 versus 12+), (4) work hours (0, 1-39 and 40+) and (5) marital status (single versus married) to determine if there was a relationship between cluster membership and any of these variables. The results of this and the profile analysis can be summarized

in tabular form. To illustrate, Table 3 constitutes such a table for the projected use items. The x's in the body of the table indicate whether a student cluster's average factor scores for a particular service goup factor was significantly ($p < .01$) higher or lower than the grand mean for all students. Thus, this table relates a student cluster's projected service use group profile to their salient background characteristics. Therefore, an examination of the table allows administrators to associate specific configurations of student characteristics with profiles of service needs. For example, cluster 1 students tend to be older, married, upperclassmen, who also are part time students with a full time job residing off campus in Ada. It seems logical that such students would express a high projected use of services related to career placement and marriage and not be very interested in most other services.

Discussion

Examination of cluster profiles like the one presented in Figure 2 and tables such as Table 3 provide the basis for matching profiles of service group ratings with characteristics of students. To illustrate, an examination of the profiles and table for the need items for the total ECU data set revealed several important facts about perceived need for services at that campus. They were:

1. Four areas were given high need scores for four of ten clusters. These were campus living conditions, career services, orientation services and some legal counseling/academic testing. Some of these services (i.e. legal counseling, 24 hour food vending, dormitory mail boxes, a career information library, and a job vacancy library) are not currently offered.

2. Nontraditional students express less need for many services and particularly career related services than traditional students. Therefore, efforts to extend these services to older, married, working and commuting students may not be necessary.
3. One group of students expressed a high need for all service areas save technical aspects of getting a job. This group tended to be composed of freshmen, juniors and graduate students living in residence halls. Thus, there is some indication that ECU has not been successful in meeting the needs of new arrivals on campus and more direct, residence hall based approaches to these students may be required.

An examination of the profiles and table for projected use items revealed findings similar to those of the need items. Living conditions are rated highly in many of the clusters. On the other hand, examination of the data for knowledge items revealed distinctly different patterns of responses which indicated that expressed need and/or projected use are not necessarily closely related to knowledge of service availability. In particular, knowledge of career services and commuter services was low in several clusters. Two clusters, composed mostly of new arrivals (i.e., freshmen or graduate students) had very low knowledge scores across a broad range of service groupings. Thus, information about these services should be targeted more directly to these types of students. Moreover, another cluster of students who tended to be older, married, graduate students, and attending part time were quite knowledgeable about most service areas. Therefore, enhanced service information dissemination activities may not be cost effective for this group.

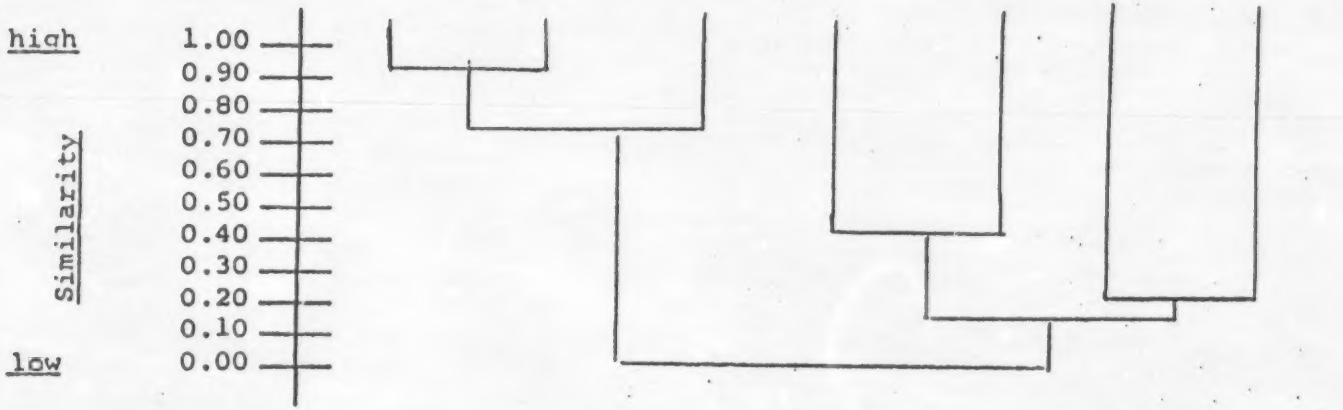
An important aspect of the information made available by an approach which asks students about their need for, use of, and knowledge of the same set

of services is implicitly revealed in the preceding set of findings but is worth mentioning explicitly at this point. That is, although students make subtle distinctions between need for and projected use of the same set of services, there is a substantial similarity in ratings on the most important services (i.e., living conditions, career and financial services). However, when knowledge of the same set of services is examined, a quite different patterning of responses is found e.g. students relatively new to the campus were less aware of the availability of programs and services than other students.

These analyses and findings illustrate the utility of the cluster analytic needs assessment model for student personnel services. First, this method facilitates assessment of each program or service within the context of the total student personnel program with respect to specific configurations of the total student body. It provides, therefore, a systematic, exact and comprehensive analysis of student service needs, intended use, and knowledge of program and services. Second, by examining use, perceived need, and knowledge simultaneously, the institutional research staff can not only assess the relative impact of the perceived need for services relative to projected use, but can also assess the feasibility of targeting dissemination efforts and particular groupings of students. We commend, therefore, this model to IR staffs charged with the responsibility of assisting student affairs administrators in continuing, modifying, deleting, or adding those programs or services designed to assist college students.

Figure 1

Illustration of dendrogram, or linkage tree used in cluster analysis[1]



[1]The dendrogram illustration was adapted from Bailey, 1977; Brown, 1977; Sills, 1968; and Tryon and Bailey, 1970. See these sources for further explanations of cluster analysis and dendrograms.

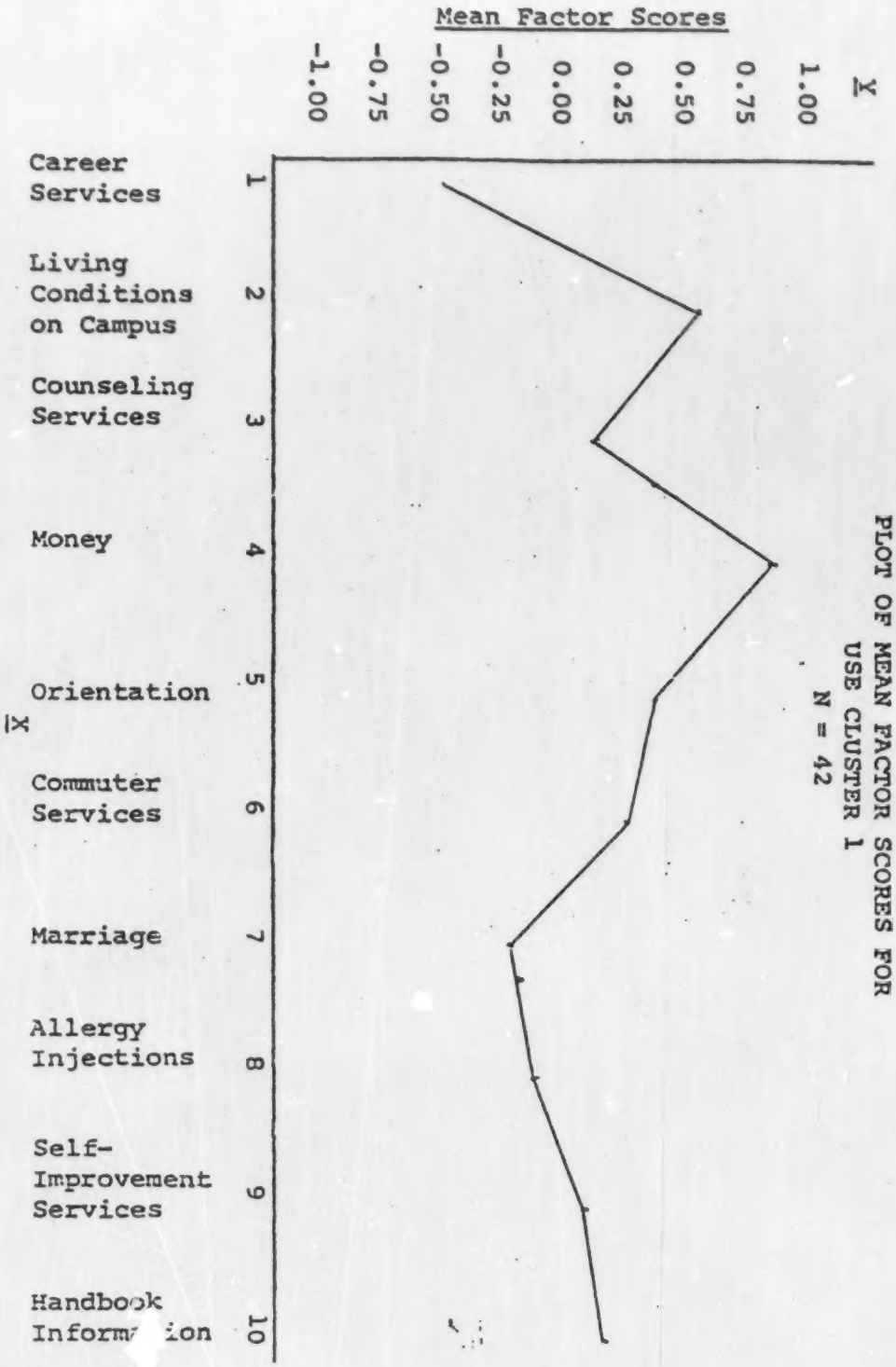


Figure 2

PLOT OF MEAN FACTOR SCORES FOR USE CLUSTER 1
N = 42

Table 1

ROTATED VARIMAX FACTOR PATTERN FOR USE ITEMS
(ABOVE .40000)
N = 518

Services	Loadings
Factor 1 Career Services	
Seminars on job getting techniques	.77184
Seminars to help in career selection	.76437
Interviews with prospective employers	.77444
Mail placement credentials to employers	.63157
Career planning counseling	.70287
Career information library	.63306
Job vacancy library	.62201
Factor 2 Living Conditions on Campus	
On campus apartment for single students	.59595
Cultural programs in residence halls	.52626
Calendar of union activities	.57093
Residence hall counselors	.68586
24 hour vending food service in the union	.59749
Student mail boxes in dorms	.75655
Student Senate	.53101
Knight Hall cafeteria	.68723
Residence hall government	.70366
Emergency maintenance	.54801
Recreational facilities	.52154
Factor 3 Counseling Services	
Counseling for legal problems	.64485
Personal counseling	.51914
Marriage counseling	.52031
Budget counseling	.48429
Alcohol education programs	.48983
Factor 4 Money	
Financial aid for part-time students	.49997
One free visit to doctor each semester	.67720

Table 1 (continued)

Services	Loadings
Factor 4 Continued	
List of apartments located off campus	.45702
Handbook on financial aid policies	.41482
Health insurance	.48063
Budget counseling	.41188
Scholarships and grants	.47887
Student credit union	.54001
Doctor on call 24 hours a day	.61497
Short term emergency loan	.64900
Factor 5 Orientation	
Orientation programs for students and spouses	.62660
Freshman orientation for credit	.65596
Orientation for all students	.66600
Summer freshman orientation	.56320
Factor 6 Commuter Services	
Overnight lodging for commuters	.78583
Lounge for commuters	.75892
Factor 7 Marriage	
On campus married student apartments	.76221
Day care center	.69064
Marriage counseling	.53564
Factor 8 Allergy Injections	
Allergy injections	.66979
Factor 9 Self Improvement Services	
Counseling for the handicapped	.51331
Tutorial programs	.43978

Table 1 (continued)

Services	Loadings
Factor 9 Continued	
Study skills courses	.55473
Work study employment	.48294
Factor 10 Handbook Information	
Calendar of student union activities	.41175
Handbook on financial aid policies	.52826
Student handbook	.71040

Table 2

ROTATED VARIMAX FACTOR PATTERN FOR NEED ITEMS
(ABOVE .4000)
N = 518

Services	Loadings
Factor 1 Living Conditions on Campus	
Residence hall counselors	.53242
24 hour vending food service in the union	.47103
Student mail boxes in dorms	.57420
Student Senate	.48571
Knight Hall cafeteria	.65372
Residence hall government	.75268
Factor 2 Career Services	
Seminars on job getting techniques	.69350
Seminars to help in career selection	.78729
Interviews with prospective employers	.48770
Personal counseling	.46220
Career planning counseling	.71467
Study skills courses	.44619
Career information library	.64873
Job vacancy library	.47434
Factor 3 Projection of Needs of Others	
Counseling for the handicapped	.58977
On campus married student apartments	.57976
Day care center	.62608
Veteran affairs counseling	.67098
Marriage counseling	.66901
Budget counseling	.50936
Alcohol education programs	.56228
Factor 4 Money	
Financial aid for part-time students	.43350
One free visit to doctor each semester	.65690
Handbook on financial aid policies	.48827
Health insurance	.42799

Table 2 Continued

Services	Loadings
Factor 4 Continued	
Scholarships and grants	.66431
Student credit union	.59042
Tutorial programs	.42575
Doctor on call 24 hours a day	.50932
Short term emergency loans	.65162
Work study employment	.53218
Factor 5 Commuter Services	
Evening hours for administrative offices	.43721
Overnight lodging for commuters	.62458
Allergy injections	.43600
Lounge for commuters	.62934
Factor 6 Food and Lodging	
On campus apartments for single students	.67843
Counseling for the handicapped	.40990
On campus married student apartments	.46072
List of apartments located off campus	.60267
Calendar of student union activities	.51502
24 hour vending food service	.45739
Factor 7 Orientation	
Orientation programs for students and spouses	.66090
Freshman orientation for credit	.49265
Orientation for all students	.70681
Summer freshman orientation	.57275
Factor 8 Campus Environmental Needs	
Student Senate	.41646
Emergency maintenance	.41087
Recreational facilities	.52986
Student handbook	.51499
Campus security	.42202

Table 2 Continued

Services	Loadings
Factor 9 Technical Aspects of Acquiring a Job	
Interviews with prospective employers	.50108
Mail placement credentials to employers	.75991
Factor 10 Legal Counseling and Achievement	
Counseling for legal problems	.55785
Achievement/personality/aptitude testing	.45059

Table 3

SUMMARY TABLE OF CHARACTERISTICS OF USE CLUSTER MEMBERS AND SERVICE RATING PROFILES

Description of Cluster Members	Level of Use*	Factor Labels: Career Services (Factor 1)	Living Conditions on Campus (Factor 2)	Counseling Services Factor 3)	Money (Factor 4)	Orientation (Factor 5)	Commuter Services Factor 6)	Marriage (Factor 7)	Allergy Injections Factor 8)	Self Improvement Services (Factor 9)	Handbook Information (Factor 10)
Cluster 1 (Nontraditional) Nontraditional age, white, juniors, seniors, married, part-time enrollment, work full-time, or commute from Ada (Note: No one in cluster lives in dorms)	High	X						X	X		
	Low		X	X	X	X	X				X
Cluster 2 (Traditional) Whites, single, sophomores, juniors, seniors, and graduate students	High								X		X
	Low			X		X	X			X	
Cluster 3 (Traditional) Traditional age, single, freshmen, sophomores, juniors, live in residence halls, full-time enrollment, and do not work	High	X	X	X		X					X
	Low									X	

Table 3 (continued)

Description of Cluster Members	Level	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Cluster 4 (Traditional) Traditional age, whites, freshmen, single, females, live in residence hall, do not work, and full-time enrollment (Note: Cluster had no graduates, part-time enrollment, or commute from outside Ada)	High		X							X	
	Low			X	X		X	X	X		
Cluster 5 (Traditional) Single and juniors	High	X					X			X	X
	Low		X	X	X	X		X	X		
Cluster 6 (Nontraditional) Nontraditional age, whites, females, graduate students, part-time enrollment, and commute from Ada	High										
	Low	X			X	X	X	X		X	X
Cluster 7 (Nontraditional) Nonwhites, married, seniors, and full-time enrollment	High			X	X			X			
	Low		X				X			X	X
Cluster 8 (Traditional) Freshmen, graduate students, and live in residence halls or commute from outside Ada	High		X	X	X	X	X	X	X		
	Low	X									

Table 3 (continued)

Description of Cluster Members	Level	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Cluster 9 (Nontraditional) Freshmen, seniors, and commute from city outside Ada	High	X			X	X	X			X	
	Low		X					X			
Cluster 10 (Nontraditional) Freshmen, graduate students, nonwhites, and commute from city outside Ada	High			X	X	X					
	Low	X									

*All ratings (high or low) are significant, $p < .01$.

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